REMARKS

Claims 1, 3, and 4-7 are now pending in this application. Claims 1-3 are rejected. Claim 2 is cancelled herein. New claims 4-7 are added. Claims 1 and 3 are amended herein to place them in better form.

Claims 1-3 have been rejected under 35 U.S.C. § 103(a) as obvious over JP 49-009465A (JP '465) in view of Metals Handbook: Vol. 1, pp. 793-800 ("the Metals Handbook").

To establish a *prima facie* case of obviousness, it is necessary to show that all the claim limitations are taught or suggested by the prior art. *See In re Royka and Martin*, 180 USPQ 580, 583, 490 F.2d 981 (CCPA 1974). Claim 1 recites the melting of steel. The abstract of JP '465 fails to disclose or suggest the melting of steel and the Office Action does not provide any motivation to modify JP '465 to include the melting of steel.

Claim 1 recites the steel having a carbon concentration of 0.01% or less. There is no disclosure or suggestion in the abstract of JP '465 of the steel having a carbon concentration of 0.01% or less. JP '465 actually teaches the opposite since graphite is added to the steel of JP '465 to decrease defects, as is clear from the abstract of JP '465.

The Office Action states that JP '465 fails to disclose the segregation ratios recited in claim 1 and relies on the Metals Handbook for this teaching. The Metals

Handbook does not disclose or suggest that a segregation ratio for Ti and for Mo of 1.3 or less is obtained or necessary. Accordingly, the cited references fail to disclose or suggest this limitation.

The Office Action states that the Metals Handbook teaches that the ingot size is adjusted to eliminate segregation. The abstract of JP '465 is silent regarding any desire to eliminate segregation and therefore there is no motivation to modify JP '465 to reduce the segregation. Furthermore, JP '465 is directed to obtaining a mold for a mirror-surface and the Office Action fails to demonstrate that segregation is a problem with molds for mirror-surfaces and that one of ordinary skill in the art would be led to modify JP '465 to have a particular segregation in the maraging steel.

Claim 1 recites hot forging at a ratio of at least 4. The Office Action states that forging at a ratio of at least 4 is not disclosed in JP '465 and relies on the Metals Handbook for this teaching. The Office Action states that the Metals Handbook teaches that maraging steels are hot worked by conventional steel mill techniques and that the Metals Handbook teaches the production of various product forms such as plate, sheet, and bar stock. The Office Action also states that Table 3 teaches ingots of 8 inches as a starting product and that such ingots can be made into a sheet or a plate which would have a thickness of much less than 8 inches and therefore fall under a forging ratio of at least 4.

There is no indication in the Metals Handbook that an 8 inch ingot is being hot forged into a sheet or plate. Table 3 discloses a comparison of mechanical properties for various maraging steel samples and there is no indication that those exact same samples are to be hot forged into a sheet or a plate. Also, the Office Action has provided no motivation to modify JP '465 to include the samples disclosed in Table 3 of the Metals Handbook. Moreover, there is no indication that the samples disclosed in Table 3 of the Metals Handbook have, for example, the nonmetallic inclusion characteristics disclosed in the abstract of JP '465. Furthermore, even if, for example, final products are to be very thin, the ingots that are made can be made thin to begin with and there is no indication of any desire to make thick ingots and then to hot forge them into thin products. Thus, there is no teaching or suggestion in any of the cited references to take a big ingot and to hot forge it into a much thinner product. Furthermore, the assertion in the Office Action that the thickness of a sheet or a plate is much less than the 2.5 inch billet or the 8 inch ingot disclosed in Table 3 of the Metals Handbook is unsupported. The Metals Handbook does not disclose any information about the dimensions of a sheet or a plate and the Office Action cannot rely on information that is absent from a reference.

Additionally, claim 1 recites that the plastic working is done after the soaking. There is no disclosure in the abstract of JP '465 of any plastic working

of a maraging steel after any soaking. The Office Action's statement that JP '465 teaches finish forming is insufficient to disclose or suggest this limitation. The abstract of JP '465 discloses "finishing" and does not describe what is meant by "finishing" and therefore the Office Action cannot assume that plastic working is taking place after any soaking in JP '465.

The Office Action states, on page 2, that "JP '465 teaches that a process of forging, heating to 1100-1200°F for 10hr, quenching, machining, aging, and finish forming said alloy is able to control the inclusion defects to ≤2 μm (abstract)." However, the process of, *inter alia*, forging as disclosed in the abstract of JP '465 is not directed to the manufacturing conditions for the maraging steel. Rather, such process is directed to the bonding of a maraging steel sheet with a corrosion-resistant stainless steel sheet. This is clear from the description in the abstract of JP '465 that "a plastic-lens mould was made by bonding a maraging steel sheet with a heat-treated, corrosion-resistant stainless steel sheet; rolling or forging at 100-1200 degrees, pressing, heating at 1100-1200 degrees for 10 hr, rapidly cooling, machining, aging at 450-550 degrees, and finishing." Thus, the forging conditions, for example, are not the same as the manufacturing conditions for decreasing inclusion defects of a maraging steel to no greater than 2 μm. The maraging steel manufacturing conditions for decreasing the inclusion defects to no greater than 2 μm are graphite

deoxidation treatment, as described in the abstract where it is stated that "[a] maraging steel . . . is deoxidized with graphite to decrease defects . . . to < 2 μm." Thus, the maraging steel manufacturing conditions recited in claim 1 are not disclosed or suggested in JP '465 in combination with the Metals Handbook.

The Office Action also cites to p. 725, 2nd column of the Metals Handbook. The Metals Handbook states, on page 795, second column, second full paragraph that "[w]ith the 18Ni(350) grade, ingot size may have to be smaller than normal." The Office Action's citation to this does not cure the fact that such citation does not disclose or suggest with specificity the parameters describing the ingot form and the treatment conditions for the ingot.

Moreover, Table 3 of the Metals Handbook discloses utilizing "200 mm (8 in.) diam [sic] vacuum induction melted/vacuum arc remelted ingots." The height of ingots is usually at most about three times the width. With this information, the weight of the ingot would be about 147kg at most. In contrast, the ingots of the present invention have weights of 1000kg (embodiment 1) and 500kg (embodiment 2), as is clear from the embodiments. Thus, this difference further demonstrates the differences between the present invention and the cited art. Additionally, Table 3 of the Metals Handbook discloses that the ingots are "vacuum induction melted/vacuum arc remelted," which is a very different manufacturing method from the present application.

Also, the forging, soaking treatment, and plastic working of the present invention provide a product with Ti and Mo component segregation ratios of 1.3 or less. This characteristic is neither disclosed nor suggested by the cited art. Moreover, avoiding vacuum arc remelting helps obtain Ti and Mo component segregation ratios of 1.3 or less, which provide excellent fatigue characteristics. The specification makes clear on page 29, first full paragraph, and in Figure 1 of the specification of the importance of the component segregation ratios being 1.3 or less for improving fatigue characteristics. Such an effect is neither described nor suggested in the cited references.

Accordingly, for the above-mentioned reasons, claim 1 is patentable over the cited art and notice to that effect is respectfully requested.

Claim 2 has been cancelled, making its rejection moot.

Claim 3 is patentable at least for the same reasons that claim 1 is patentable because of the similarities.

The Office Action states that JP '465 does not disclose casting and relies on the Metals Handbook for this teaching. The Office Action states that as recognized in the Metals Handbook, that ingot size/shape is a result effective variable and that therefore it would be obvious to optimize the size/shape of the ingot to lower the degree of segregation.

There is no disclosure or suggestion in the Metals Handbook about the effects of different relative dimensions of an ingot. Claim 3 recites certain ranges for the taper, the flatness ratio, and the height-diameter ratio. Nothing in the Metals Handbook discloses or suggests any of the taper, the flatness ratio, or the height-diameter ratio has an effect on microsegregation. Furthermore, nothing in the Metals Handbook discloses that the relative values of the dimensions reflected by the taper, the flatness ratio, or the height-diameter ratio have any effect on the microsegregation. Thus, the taper, the flatness ratio, and the height-diameter ratio are not recognized as result-effective variables in the Metals Handbook and therefore it would not be obvious to optimize them to arrive at the claimed invention. The Office Action's statement that the ingot size affects segregation does not cure the deficiency in disclosure regarding, *inter alia*, the effects of taper, flatness ratio, and height-diameter ratio.

Furthermore, the Office Action's stated motivation for the optimization is to reduce segregation. The Office Action has provided no evidence that the claimed taper, flatness ratio, or height-diameter ratio provide a shape that optimally minimizes the segregation and therefore there is insufficient motivation to modify JP '465 to utilize an ingot with the claimed dimensions. Furthermore, there is no disclosure or suggestion in JP '465 that the segregation is of any importance, as stated above regarding claim 1.

Accordingly, for the aforementioned reasons, claim 3 is patentable over the cited art and notice to that effect is respectfully requested.

New claims 4-7 are patentable at least for the reason that they depend from a patentable base claim. *See In re Fine*, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). Moreover, claims 4 and 5 recite that the process excludes arc remelting, which the cited art fails to disclose or suggest. Also, claims 6 and 7 recite that total hot holding time is 20-100 hours while the cited art fails to disclose or suggest this limitation.

Claims 1 and 3 have been amended to place them in better form and support for these amendments can be found in, for example, claims 1 and 3 as originally filed. New claims 4-7 have been added, support being found, for example, in the specification in the paragraph bridging pages 16-17 and on page 17, first full paragraph.

Applicant respectfully requests a one month extension of time for responding to the Office Action. **The fee of $120.00 for the extension is provided for in the charge authorization presented in the PTO Form 2038, Credit Card Payment form, provided herewith.**

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hereby authorized to charge any fee(s) or fee(s) deficiency or credit any excess payment to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,

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